

PO-0726**Rotational optimization appears undeferrable in IGRT prostate: first analysis of the Protura 6DOF robotic couchtop**V. Frascino¹, S. Chiesa¹, L. Placidi², L. Azario², G.C. Mattiucci¹, F. De Rose¹, V. Valentini¹, M. Balducci¹¹Università Cattolica del Sacro Cuore, Department of Radiotherapy and Radio-Oncology, Rome, Italy²Università Cattolica del Sacro Cuore, Institute of Medical Physics, Rome, Italy

Purpose/Objective: To evaluate the relevance of rotational shift in IGRT prostate RapidArc and to validate the added value of Protura 6 degree of freedom (DOF) Robotic Patient Positioning System (CIVCO Medical Solution) to improve setup accuracy with the Cone Beam CT scanner (CBCT).

Materials and Methods: We enrolled patients with cT3aN0M0 low risk for nodal involvement prostate cancer. RapidArc simultaneous integrated boost treatment plans were made; a total dose of 80Gy (200cGy/fraction) to prostate and 72Gy (180cGy/fraction) to the seminal vesicle base were delivered. Patients in supine position with dual leg immobilization (CIVCO support system) underwent to simulation a computerized tomography (CT) scan for radiotherapy planning. A CBCT was performed daily before dose delivery. Images were then compared with the simulation CT images in order to determine the magnitude of set-up error and organ motion. Translational (Lateral, Vertical and Longitudinal) and Rotational (Pitch, Yaw and Roll) shifts were identified with manual and/or automatic 3D matching (Varian 6D Online Review System). The collected shifts were applied on the Protura Robotic Patient Positioning System to obtain a more accurate alignment. Mean translation and rotation shifts were calculated. The 3D-vector of displacement was also worked out and the total procedure time was recorded.

Results: From October to December 2012, we enrolled 5 patients with a median age of 76 yrs (range 64-78). One hundred and thirty-two CBCT studies were performed and compared to CT images. The mean (\pm SD) interfraction displacement in vertical, lateral and longitudinal direction was -0.2 ± 0.3 cm, 0.0 ± 0.3 cm and -0.2 ± 0.5 cm respectively. The maximal translation setup shift was 1.4 cm vertically, 1.6 cm longitudinally and 1 cm laterally, with 98% of the shifts < 1 cm. The mean (\pm SD) 3D vector of displacement was 0.3 ± 0.7 cm. The mean (\pm SD) interfraction rotations were: Pitch = $-0.4 \pm 1.1^\circ$, Roll = $-0.5 \pm 1.2^\circ$ and Yaw = $0.1 \pm 0.7^\circ$. The maximal rotation error was 2.8° for Pitch, 3.8° for Roll and 2.1° for Yaw, with 91% of the rotations $< 2^\circ$. No correlation was observed between the magnitude of translational and rotational shift. The mean time for all treatment procedures was 14.52 ± 2.02 minutes. Despite the manual transfer of data to the Protura software in this phase, no more than one extra minute was required compared to the standard procedure.

Conclusions: Our preliminary data shows that the Protura Robotic Patient Positioning System is essential to improve accuracy in the IGRT era. It underlines the necessity to perform rotational shifts, especially in prostate treatments. Correlation between volumetric and geometrical shift data and evaluation of its dosimetric impact on adaptive dose is ongoing.

PO-0727**Prostate bed motion using an endorectal balloon and CBCT during postprostatectomy radiotherapy**J.H.J. Jung¹, Y.S.K. Kim¹, S.D.A. Ahn¹, B.C.C. Cho¹, S.H.P. Park¹, J.W.K. Kwak¹¹Asan Medical Center, Radiation Oncology, Seoul, Korea Republic of

Purpose/Objective: To analyse inter-fractional prostate bed motion (PBM) and to quantify its components using an endorectal balloon (ERB) and daily cone beam computed tomography (CBCT).

Materials and Methods: A total of 1,348 CBCT images from 46 patients who underwent postprostatectomy radiotherapy were analysed. Total set-up error was defined as the shift from the skin mark to the prostate bed matching, based on anterior rectal wall stretching by the ERB. Prostate bed motion (PBM) was defined as the difference between the total set-up error and bony misalignment (BM).

Results: The systematic errors for the total set-up error were 1.0, 1.3, and 1.0 mm in the right-left, anterior-posterior, and superior-inferior directions, respectively, with random errors of 1.9, 2.4, and 1.9 mm, respectively. Systematic errors were 1.6, 1.6, and 0.3 mm for BM and 0.8, 1.1, and 0.9 mm for PBM, with random errors of 2.4, 2.5, and 1.1 mm for BM and 1.8, 2.2, and 1.9 mm for PBM.

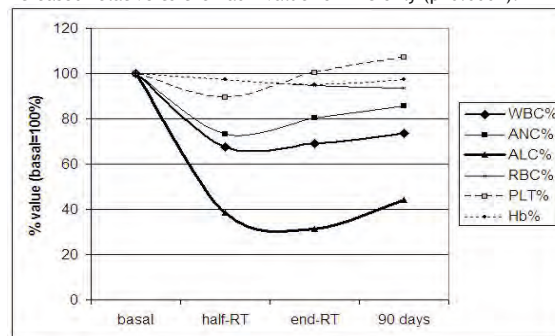
Conclusions: Planning target volume margins of < 5 mm were needed to include 95% of the inter-fractional variations when using an ERB. The BM was the main component of the total set-up error, which indicated that inter-fractional PBM was well controlled by the ERB.

PO-0728**Longitudinal evaluation of acute haematologic toxicity from whole-pelvis post-prostatectomy radiotherapy.**S. Brenna¹, C. Cozzarini², C. Fiorino³, G. Agnello³, L. Perna³, C. Deantonio², V. Sacco², A. Sbalchiero², F. Zerbetto², N. Di Muzio²¹A.S. Gerardo, Radiotherapy Unit, Monza, Italy²San Raffaele Scientific Institute, Radiotherapy, Milan, Italy³San Raffaele Scientific Institute, Medical Physics, Milan, Italy

Purpose/Objective: Whole-pelvis radiotherapy (WPRT) may have a role in post-prostatectomy (POSTOP), both adjuvant (ADV) and salvage (SALV) radiotherapy (RT) after radical prostatectomy for prostate cancer (PCa). Haematological toxicity (HT) from WPRT for PCa has never been evaluated. Moreover, HT from WPRT has thus far been analyzed only in patients treated with concurrent chemoradiation. A prospective evaluation of HT in PCa patients receiving postoperative WPRT was therefore activated.

Materials and Methods: From November 2011 to October 2012, 50 consecutive patients receiving WPRT as a part of ADV (n=29) or SALV (n=21) POSTOP RT were analyzed. The collection of a complete blood sample before RT start (baseline), at RT mid-point, at RT end, at 90 days from RT completion and subsequently every six months for 3 years was planned. This first analysis is aimed at quantifying early blood cell changes on the first 50 patients with complete baseline, mid-point and end RT data; for 25/50, data at 90 days were also available. Patients were treated with conventionally fractionated (CF, 1.80 Gy/fraction, n=16) or moderately hypofractionated (HYPO, 2.35-2.60 Gy/fr, median 2.35, n=34) RT, with IMRT (n=13), Volumetric Arc (VMAT, n=31) or Helical Tomotherapy (n=6) technique. For CF and HYPO, RT dose to the prostatic bed ranged from 72 to 77.4 Gy and from 65.8 to 72.8 Gy, respectively, while WPRT dose was 50.4 and 51.8 Gy, respectively. Mean and median values of white (WBC) and red blood cells (RBC), platelets (PLT) and haemoglobin (Hb) were calculated for each time point. Significant differences against the baseline were assessed by the Mann-Whitney test. Difference between the nadir value and the last available value was also tested.

Results: Results are summarized in Figure 1. Median WBC count at RT mid-point and at RT end were 67% and 68% of the baseline, respectively. The corresponding values for RBC, PLT and Hb were: 97% and 95% for RBC, 89% and 101% for PLT, and 97% and 95% for Hb. When focusing on WBC subpopulations, the acute HT was found to be more significant: the corresponding median absolute neutrophil and lymphocyte counts (ANC and ALC, respectively) were, in fact, 73% and 80% for ANC, and 38% and 31% for ALC, respectively. For patients with data available at 90 days from RT end, the WBC, RBC, PLT, Hb, ANC and ALC median values were 73%, 93%, 107%, 97%, 86% and 44% of the corresponding baseline. The differences between the nadir and the basal value was significant ($p < 0.0016$) for all parameters except PLT. The last available value (end RT or 90 days) was significantly increased relative to the nadir value for ALC only ($p < 0.0001$).



Conclusions: A significant blood count reduction, particularly significant for ALC, occurs during and immediately after post-prostatectomy WPRT. Future analyses will focus on the long-term recovery of HT on a much larger population as well as on the assessment of dosimetry and clinical predictors of HT.

PO-0729**Development of late toxicity treated with image-guided volumetric modulated arc therapy for prostate cancer.**K. Yamamoto¹, K. Shiraishi¹, A. Nomoto¹, A. Haga¹, A. Sakumi¹, K. Nakagawa¹¹Tokyo Univ. Hosp. Radiology, Radiology, Tokyo, Japan

Purpose/Objective: To evaluate the genitourinary toxicity and chronological changes of the International Prostate Symptom Score